MINERALS AND ENERGY DIVISION
DEPARTMENT OF NATURAL RESOURCES
AND ENERGY
NEW BRUNSWICK

Open File Report 88-8

MINERAL PROCESSING INVESTIGATIONS PROGRAM (MPIP)

REFERENCE MANUAL

by

J. Dean Thibault

Canada-New Brunswick Mineral Development Agreement
Entente Canada-Nouveau-Brunswick L'Exploitation Minérale

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1988

MINERAL PROCESSING INVESTIGATIONS PROGRAM (MPIP)

REFERENCE MANUAL

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MINERAL PROCESSING INVESTIGATIONS PROGRAM

MPIP

PROGRAM REFERENCE MANUAL

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Revision 1: March 1987

A. PROGRAM DESCRIPTION

The Mineral Processing Investigations Program (MPIP) was established in July 1986 under the Canada/New Brunswick Mineral Development Agreement for the purpose of assisting the mining industry with seed development of mineral extraction technology and the optimization of mill operations. The Department of Natural Resources and Energy (DNR&E) and EMR's Canada Centre for Mineral and and Energy Technology (CANMET) are working with the industry of New Brunswick in developing mineral resources. All MPIP projects are fully funded by the federal government and are delivered by the provincial Department of Natural Resources and Energy (Process Studies Group of the Mineral Development Branch).

The MPIP has been designed to address through DNR&E three main concerns:

Application of Commercial Technology

* identification of physical and chemical processing methods to upgrade and purify mineral concentrates.
* strengthen grass root development where processing alternatives have to be identified with respect to various market options.

Optimization of Metal Recovery

* identification of limitations to improved recovery of metals.
* assess the possibilities of by-product recovery from existing operations.

Technology Transfer

* documentation of the limitations to metal and mineral extraction efficiency, so research and development can be directed towards topics of immediate benefit to industry.
* to provide a "hands-on" approach to strengthen government funded research and development.

To address these above concerns, DNR&E has initiated two types of studies:

Initiative Studies - which provide the capability of evaluating new deposits for their mine making potential.

Improvement Studies - which provide the capability of assessing the effectiveness of current technology in improving the recovery and grade of concentrates extracted from New Brunswick ores.

The concepts developed by MPIP studies undergo a preliminary technical and economic evaluation for commercialization. The studies carried out under MPIP are to provide concepts to strengthen the development of mineral resources through low-cost incubation lab studies. The secondary development initiated from these studies will benefit in the creation of new operations and in improving the economic life of active operations. It is expected that future development of the mineral industry in New Brunswick will proceed through the opening of many low tonnage installations.

Descriptions of initiative and improvement type studies follow where details of each project can be found in Appendix I.

The Initiative Studies - taking the offense:

The Initiative Studies carried out by DNR&E, which are described below, are designed to interest the private sector in the processing possibilities within the province. It is hoped that industry and research and development organizations will follow up the MPIP studies with detailed studies that will lead to large-scale development programs. Under the MPIP, DNR&E has identified, and started work on the following studies:

1. Leachability of New Brunswick's Gold Ores - low-grade gold deposits of New Brunswick that were once considered uneconomic are now being exploited because of improvements in extraction technology and treatment of oxidizing effluents. Limited technical information exists on the leachability of New Brunswick precious metal ores using heap leaching methods. The project will examine the technical feasibility for leaching and possible recoveries of metal.

2. Extraction Possibilities of Specialty Metals - Various documents have suggested high growth potential for metals used in electronics, specialty ceramics, catalysts, alloys, and chemicals. The project will identify the sources of such specialty metals as titanium, beryllium, gallium, germanium, indium, lithium, magnesium, the platinum group and rare earths from various ores and tailings within the province. Bench-scale testing of alternative extraction methods will be carried out to indicate technical-economic feasibilities.

3. Benefication of Complex Sulfide Ores for Add-On Processing - Pyrometallurgical and Hydrometallurgical processing routes are becoming more attractive for improved recovery of complex sulfide metals; however, limited technical information exists on the optimization of a flowsheet and grade-recovery for production of bulk concentrates. The project is aimed at providing some technical background for custom mailing.

4. Process Development of Industrial Minerals - the upgrading properties of various industrial mineral ores will be investigated to characterize the ore for potential processing plants.

The Improvement Studies - on the defense:

The improvement studies carried out by DNR&E are aimed at providing technical assistance to New Brunswick operators by developing a detailed understanding of the grade-recovery relationships for their ore. Information will be provided to operators to increase the economic life of their existing operations and to provide basic information for further development. Under the MPIP, the following studies have been identified as improvement studies:

1. Optimization of Grade and Recovery at Durham Resources Inc. Mine - sampling of the entire circuit will be carried out under steady-state conditions to establish data on recirculating loads, classification efficiencies and a mass balance. Bench-scale testing will be carried out to determine optimum liberation size. Operating data on the limitations to ore separability will be established and recommendations for optimizing grade-recovery will be made.

2. Further Processing of Antimony Concentrates - the project will review various commercial technologies available for producing an oxide or a metal from sulfide concentrates. Bench-scale tests of process options will be used to identify the technical bottlenecks of oxide and/or metal production.

3. Process Development on Mount Pleasant Ore - the North Fire Tower zone at Mount Pleasant contains a complex mixture of tungsten, molybdenum, tin, fluorspar and various sulfides that are metallurgically quite difficult to separate. The project will investigate various possible flowsheet configurations and identify grade-recovery relationships as a function of grind.

DNR&E does not retain or acquire any ownership of intellectual property or any royalty interest related to the projects, nor is there any obligation to industry as a result of the project findings. The intent of the MPIP is to provide sound technical support to the New Brunswick mineral industry in extraction technology and for optimization of grade and recovery of mineral concentrates.

If you have any questions, or need more information, please contact:

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B. BACKGROUND TO THE PROGRAM DEVELOPMENT

The overall goal of the Process Studies Group is to evaluate emerging technologies and processes, to liaise with industry, and to recommend to the province various ways in which research and development can be of some assistance to the Mineral Industry of New Brunswick. Prior to the Mineral Processing Investigations Program (MPIP), a study was conducted by the Mineral Development Branch on limitations to mineral processing developing in New Brunswick.

In consultation with industry and various Departments within the Government, major limitations were identified as:

Grass Roots Development

In order to develop a mineral resource, the two most important factors are reserve tonnages and market penetration. As illustrated in figure 1, the selection of a process is strongly dependent on the market and ore grades. A key link to mineral development is an understanding of process technology which is economically successful in bringing a mineral resource to a market.

A fair number of diversified mineral resources, with complex mineralogy, have been identified within New Brunswick, however, there is limited background on mineral separation characteristics and ore reserve estimation. In order to strengthen grass root development (known as pre-production development), mineral processing alternatives have to be identified, with respect to various market options.

Optimization of Mill Operations

The need for technical support staff has been recognized by most operators to improve on milling efficiency. Troubleshooting a process requires a good understanding of the relationship between technical and economic factors influencing the efficiency of an operation as illustrated in figure 2.

Economic indicators suggest that the future development of mining in New Brunswick will proceed through the opening of many small installations. Technical support is needed without increasing financial burden, by analysis of perceived problems, followed by in-plant controlled testing and/or bench-scale evaluations.

Problem Identification and Technology Transfer

A clear definition of problems related with mineral recovery and metal extraction systems must be identified on New Brunswick ores, where information can be directed to research and development so unbias approaches are undertaken to resolve technical constraints and benefit industry. In order to establish a system of information-technology transfer, the Process Studies Group makes available to industry the basic methods used in process development in addition to informing research and development of process limitations as illustrated in figure 3.

MINERAL RESOURCE DEVELOPMENT OVERVIEW

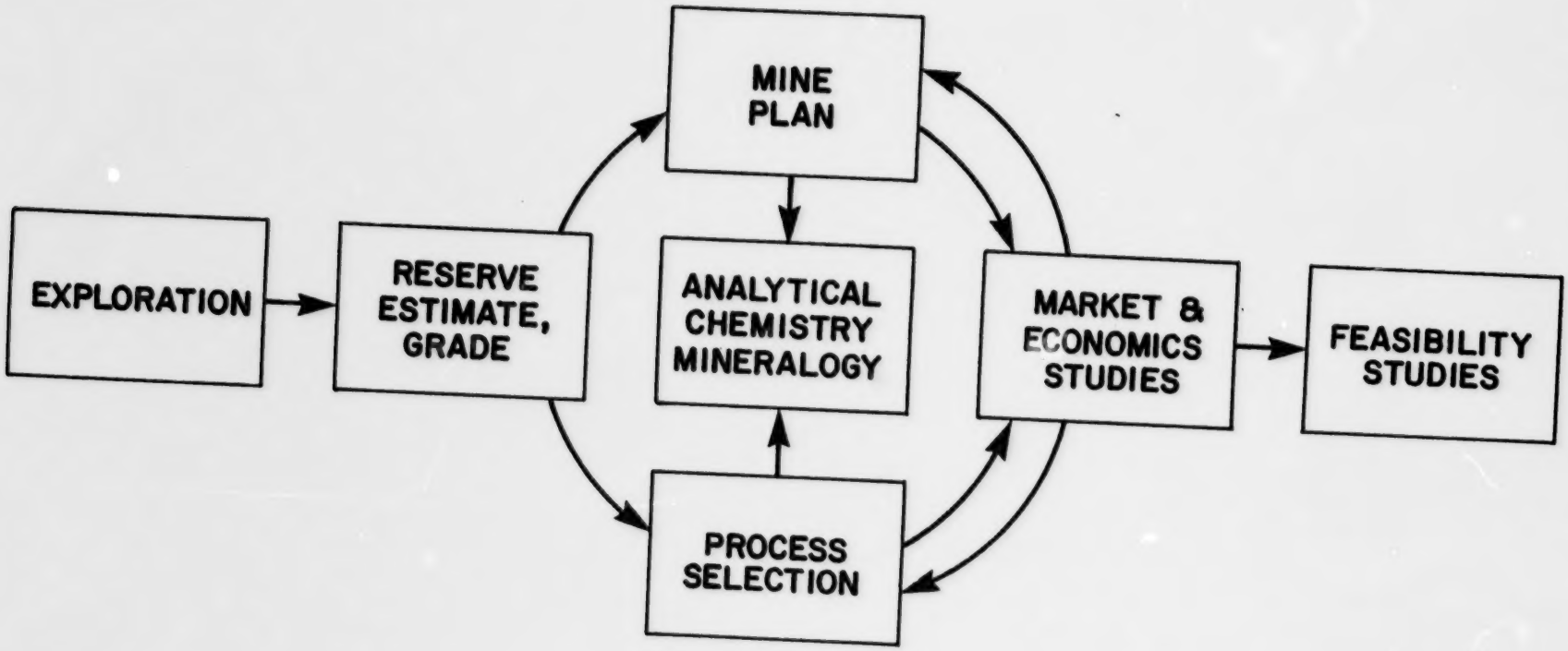

FIGURE 1: The interrelationships of various disciplines responsible for establishing a profitable venture (critical path for pre-production development).

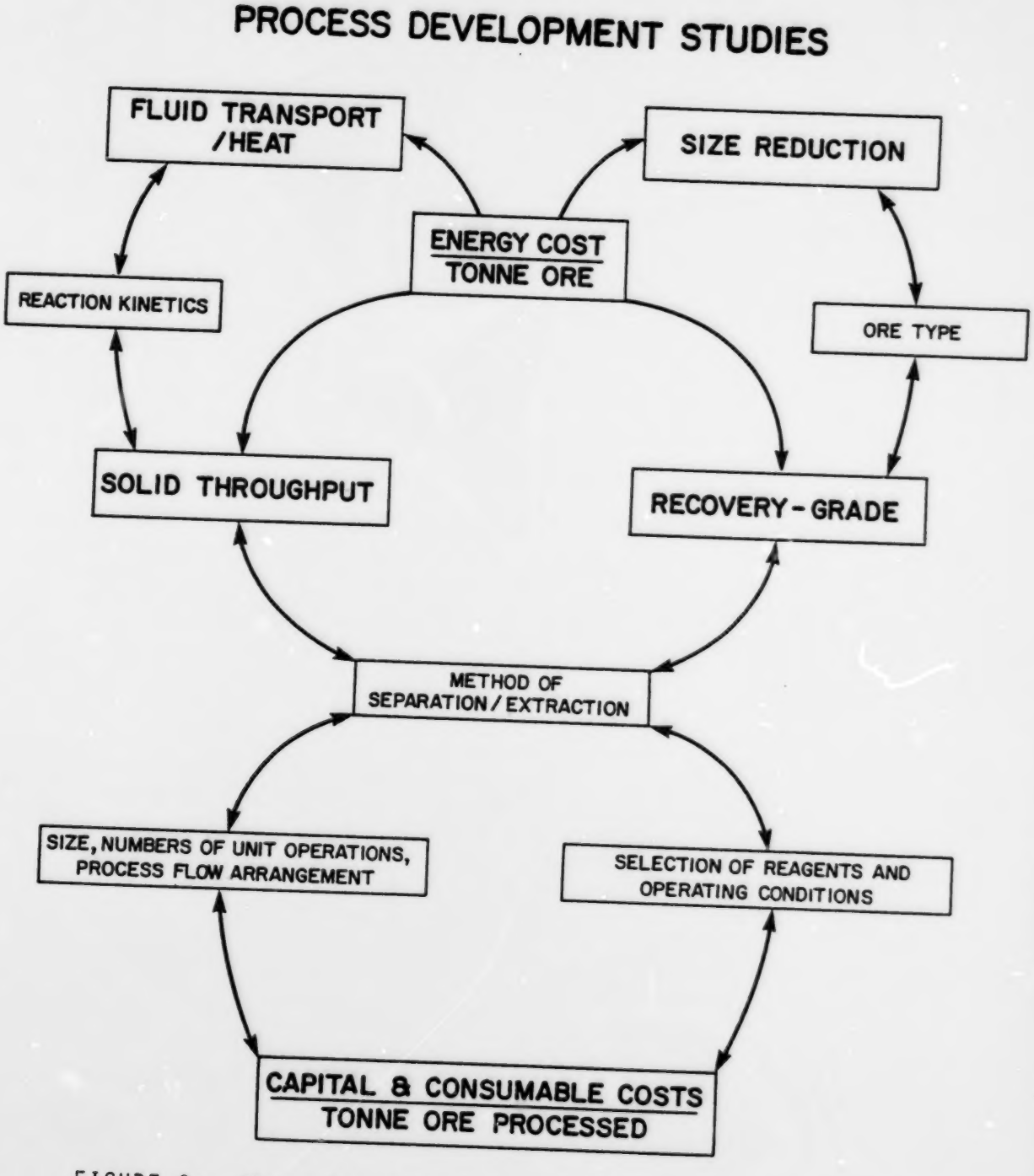
PROCESS DEVELOPMENT STUDIES
FLUID TRANSPORT /HEAT
SIZE REDUCTION
ENERGY COST / TONNE ORE
REACTION KINETICS
ORE TYPE
SOLID THROUGHPUT
RECOVERY - GRADE
METHOD OF SEPARATION / EXTRACTION
SIZE, NUMBERS OF UNIT OPERATIONS, PROCESS FLOW ARRANGEMENT
SELECTION OF REAGENTS AND OPERATING CONDITIONS
CAPITAL & CONSUMABLE COSTS / TONNE ORE PROCESSED

FIGURE 2: The relationship of process technology of mineral separation-extraction system with capital investment and operating costs.

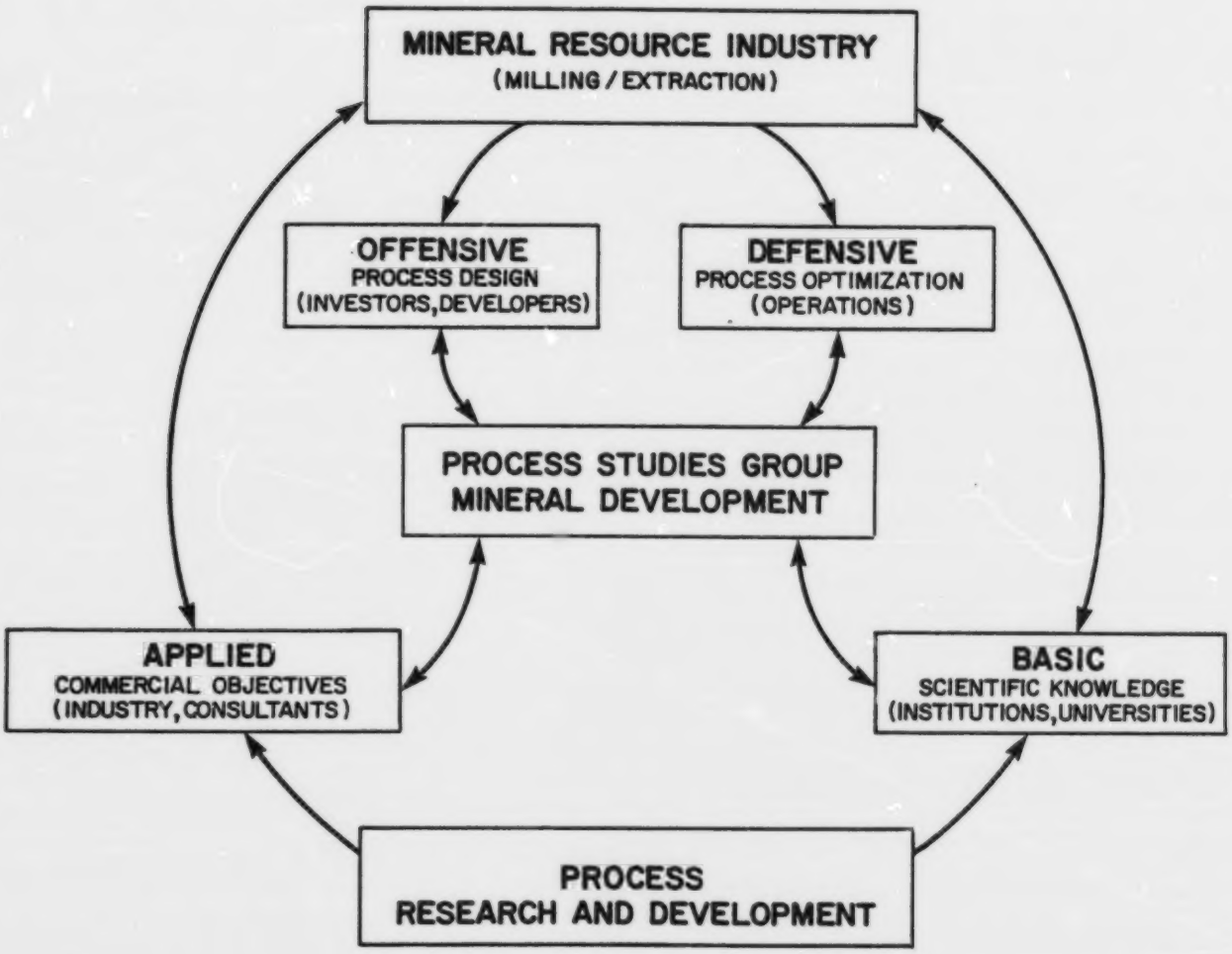

FIGURE 3: Illustration of the technology transfer between various groups and the Process Studies Group.

C. PROGRAM ADMINISTRATION

In recognition of the limitations to mineral processing within New Brunswick, the concept of administering an "incubation lab" was established by the Mineral Resource Division. The primary objective of an incubation lab is to establish concepts of metal extraction possibilities and identify technical problems with milling of New Brunswick ores. These concepts are to undergo a technical and economic evaluation for commercialization, hence to identify the need for large scale research and development.

The primary objective of the Mineral Processing Investigations Group is to promote the development of metal extraction technology in New Brunswick. Development is defined as the engineering activity required to advance the technology of a metal extraction process to the point where it meets specific functional and economic requirements. The group involved with the administration of MPIP is outlined as follows, where Engineering Technicians are funded by MPIP.

> Process Engineer - group leader who provides technical background to engineering and chemical concepts in mineral processing and relates commercialized concepts to lab programs.
>
> Project Engineer - establishes preliminary feasibility studies to relate process studies to ore reserves and market possibilities.
>
> Metallurgical Engineering Technician - manages in-plant and lab studies relating to hydro and pyrometallurgy.

Projects administered by the Process Studies Group have a generalized critical path. Projects originate through discussions with industry and other government departments where the potential of a lab study is evaluated by a prefeasibility review. The prefeasibility review will identify areas of development for a lab program. Data from the lab program is used to establish a preliminary technical and economic feasibility for commercialization providing a direction for further research and development. It is our objective to strengthen seed development by following this critical path.

Various projects carried out under the Mineral Processing Investigations Program may lead to further development by industry under the Mineral Investment Stimulation Program which provides financial assistance for development, managed by the private sector. The relationship of both programs with a venture life cycle is shown in Figure 5. As a result of the MPIP studies, various concepts are to be developed to provide some basis for an industrial development strategy.

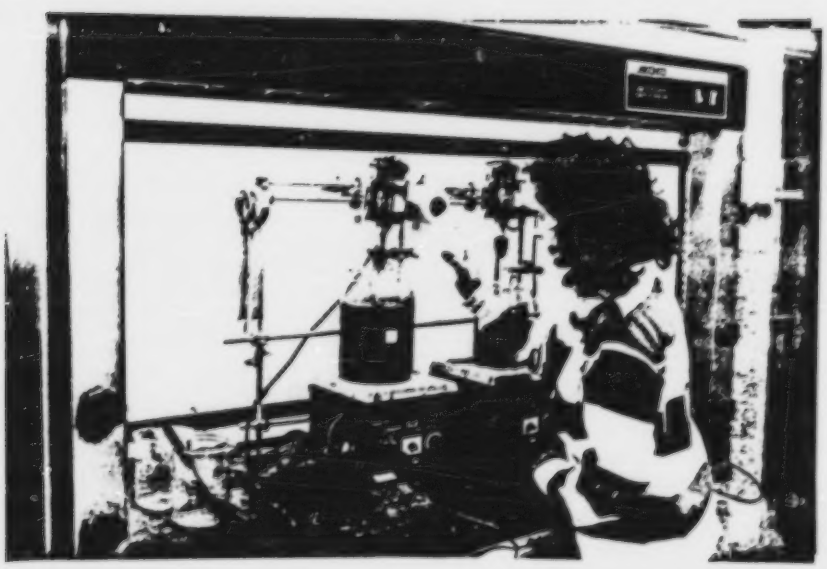

FIGURE 4: The "incubation lab" concept involves on-site discussion and sampling in addition to bench-scale characterization of ore separability and upgrading.

MINERAL RESOURCE PRODUCTION LIFE CYCLE

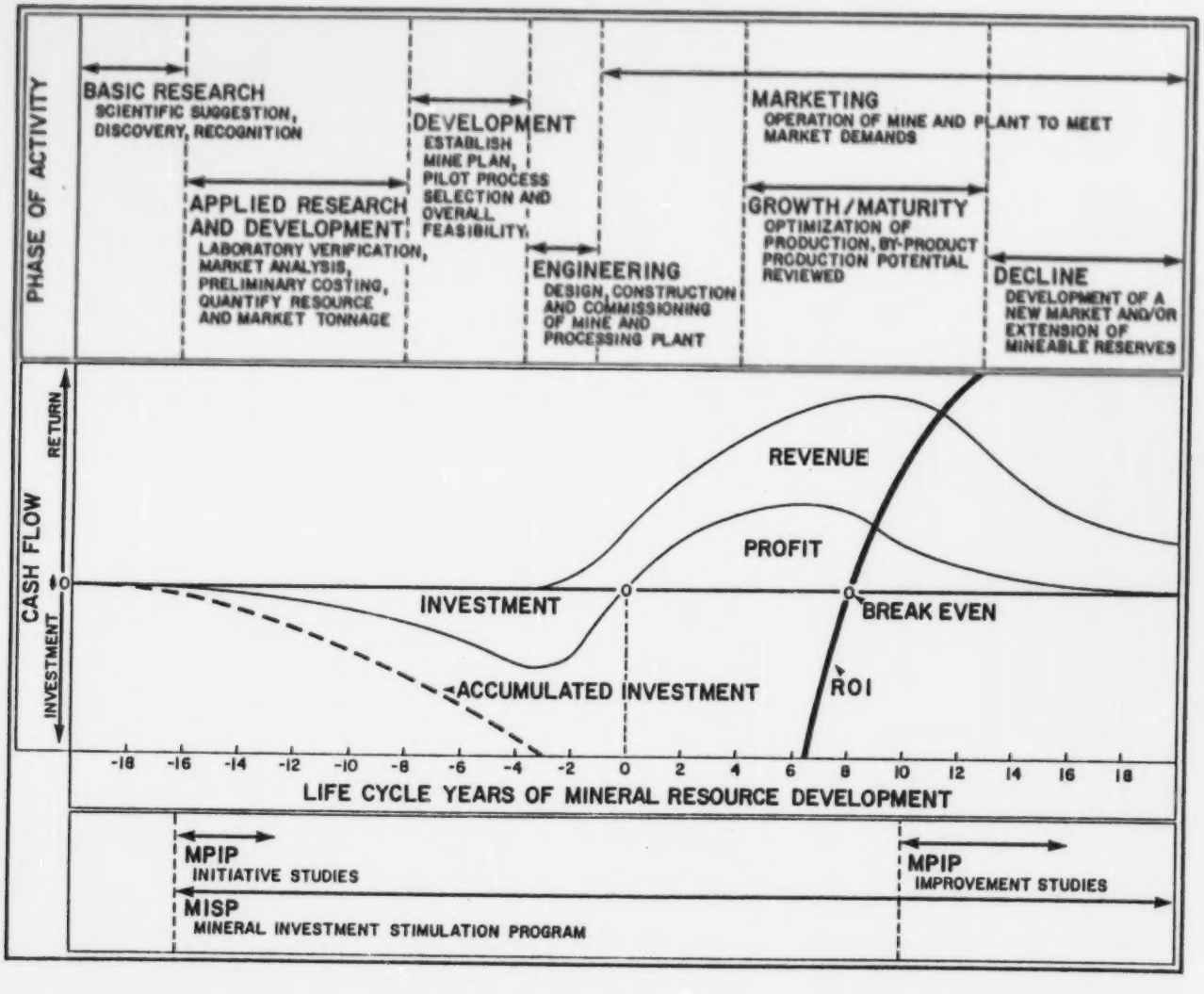

FIGURE 5: Relationship of MDA development programs with the development and operation of a mineral resource.

APPENDIX I

PROJECT IDENTIFICATIONS AND CASH FLOWS

Year: 1987-88

Date: February 23, 1987

Original: January 22, 19866
Revised: February 23, 1987

Multiyear Operation Plan

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

AREA: New Brunswick

PROGRAM: II - Mining and Minerals Technology

SUBPROGRAM: Mineral Processing Investigations Program (MPIP)

RESPONSIBILITY: Mineral Development - DNRE

OBJECTIVES AND DESCRIPTION:
(why, what, when, by whom, how)

DURATION: July 1986 - March 1989

Investigations to be carried out using bench-scale testing methods to review methods of improving process recovery-grade relationships and to identify alternative processing methods. Investigations will include in-plant controlled testing and the development of metal extraction methods.

OUTPUTS:

Progress reports and final reports to be compiled by Mineral Resources.

BENEFITS:

Stimulate interest to the mining sector of New Brunswick of possible metal extraction methods and to assist on improving extraction recoveries. This type of technical assistance will help promote the mining industry in New Brunswick.

RESOURCES(EST)	84/85	85/86	86/87	87/88	88/89	Total
Administration	-	-	121,000 (2)	60,000 (2)	60,000 (2)	241,000 (2)
Project Expenditures	-	-	79,000	40,000	40,000	159,000
Other	-	-	0	0	0	0
Total	-	-	200,000	100,000	100,000	400,000

PLANS FOR FISCAL YEAR

-include implementation process, what will be done, where, expected outputs etc.

-final reports on projects carried out FY 86/87 to be completed regarding:
(a) Further processing of antimony concentrates.
(b) Optimization of grade and recovery at Durham antimony mine.
(c) Leachability of New Brunswick gold ores.
(d) Extraction possibilities of speciality metals - phase I.

-bench scale lab program to be completed on the following projects (PIAP's attached).
(e) Beneficiation of complex sulfide ores for add-on processing.
(f) Process development of Mount Pleasant ores (Fire Tower Zone).
(g) Processing of speciality metals - phase II.

Year: 1986-87

Date: May 26, 1986

Original: April 30, 1986

Revised: May 22, 1986

PROJECT IDENTIFICATION AND ANNUAL PLAN

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

Area: New Brunswick

PROGRAM: II - Mining and Minerals Technology

PROJECT: Optimization of a Grade and Recovery at Durham Antimony Mine

RESPONSIBILITY: Mineral Resources

DURATION: June-December 1986

OBJECTIVES AND DESCRIPTION (WHY, WHAT, WHEN, BY WHOM, HOW):

One of major deficiencies in metal extraction circuits is the grinding unit operation being very costly with respect to power and grinding media, in addition to controlling the grade-recovery relationships of a beneficiation circuit. A possible problem at the Durham Mine antimony concentrator is the high loss of metal due to the overgrind of ore. Durham concentrator is presently operating two ball mills in series having classification after each mill. A study is required to optimize milling of ores to improve on grade-recovery relationships, throughput and stablization of beneification circuit.

OUTPUTS:

Final report to be compiled to include operating data of existing operation, liberation size characteristics, recommendations to optimize circuit.

BENEFITS:

To provide technical operating information as guidelines to optimize concentrator recovery, grade and throughput.

RESOURCES (EST.):

	86/87
Manhours: 564 hrs.:	$ 9,452
Project Expenditures	$25,000
Equipment:	$15,000
Total	$49,452

PLANS FOR FISCAL YEAR:

- Sampling of existing flowsheet configuration and data collection for mass balance, particle size analysis, recirculating loads, classification efficiency, etc. An evaluation of circuit operating parameters will be carried out along with the quantification of the amount of metal recovered.
- Define problem with recovery-grade limitations on plant operation.
- Ore samples to be collected and a bench-scale study of liberation characteristics will be carried out. Liberation will be determined by batch flotation tests on various grinds. A work index on ore to be determined.
- Image analysis on key streams to quantify liberation.
- Recommendations on circuit operating parameters to be made.

Original: April 30, 1986

Revised: May 22, 1986

PROJECT IDENTIFICATION AND ANNUAL PLAN

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

Area: New Brunswick

PROGRAM: II - Mining and Minerals Technology

PROJECT: Further Processing of Antimony Concentrates

RESPONSIBILITY: Mineral Resources

DURATION: June-October 1986

OBJECTIVES AND DESCRIPTION (WHY, WHAT, WHEN, BY WHOM, HOW):

Durham Resources are presently operating a stibnite (Sb_2S_3) concentrator which includes the grinding and flotation of ore. The market for sulfide on the eastern sea board has depleated because standards placed on sulfur emission have resulted in the closure of various smelters. The North American market for antimony oxide and antimony metal remains very strong. In order for Durham Resources to remain competitive, an "add-on" processing unit is required to produce oxide and/or metal from antimony concentrates containing about 66% Sb. Various pyro and hydrometallurgical processes exist commercially and various processes are undergoing development. The technological problems associated with process selection is the high heat of reaction in the oxidation of stibnite, the complex chemistry of oxidation and reduction and the presence of arsenic and lead in the flotation concentrates.

OUTPUTS:

Final report to be compiled by Mineral Resources outlining the advantages of each process and recommendations based on the bench scale investigations of process alternatives.

BENEFITS:

To provide information to industry on the possible processing alternatives for upgrading high-grade antimony sulfide concentrates and to provide a guideline for commercial practicality of a upgrading unit.

RESOURCES (EST.):

	86/87
Manhours: 550 hrs.:	$ 6,931
Project Expenditures:	$ 9,500
Equipment:	$15,000
Total	$31,431

PLANS FOR FISCAL YEAR:

- A literature search on processing methods for the production of antimony oxide and metal from sulfide concentrates will be compiled. Both hydro and pyro processing methods will be considered and commercial operators and developers will be consulted on process alternatives. Concentrate will be collected for complete mineralogical analysis and bench testing.
- A process evaluation will be carried out on the possible routes, based on a technical and economic feasibility of each process.
- Three processes will be selected for a bench-scale evaluation of grade and recovery relationships. An economic and technical evaluation will be carried out based on bench-scale data.
- Final report compiled and recommendations on process selection.

Year: 1986-87

Date: May 26, 1986

Original: April 30, 1986

Revised: September 15, 1986

Project Identification and Annual Plan

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

AREA: New Brunswick

PROGRAM: II - Mining and Minerals Technology

PROJECT: Leachability of New Brunswick Gold Ores

RESPONSIBILITY: Mineral Resources

DURATION: October-March, 1987

OBJECTIVES AND DESCRIPTION (why, what, when, by whom, how):

Many low grade gold deposits of New Brunswick that were once considered uneconomic are now being exploited because of important improvements in the technology of leaching and treatment of oxidizing leachants. Very little technical information exists on the leachability of New Brunswick precious metal ores using conventional oxidizing agents. This project will examine the mineralogy of existing precious metal deposits and identify the leachability of these ores using conventional heap leach methods.

OUTPUTS:

Final report on recovery of precious metals from various ores using diversified operating conditions. Based on preliminary data, further leachability testing will be done on one deposit to initialize the development of a heap leach operation.

BENEFITS:

To identify possible recoveries of precious metals and provide a data base for preliminary process economics for commercialized operations.

RESOURCES(EST)	86/87
Manhours: 1100 hrs.:	$13,863
Project Expenditures:	$19,000
Equipment:	$15,000
Total	$47,863

PLANS FOR FISCAL YEAR

- Collection of ore samples from various sites and a complete mineralogical examination will be conducted to identify any interfering substances.
- The leachability of various precious metal ores will be tested using bench-scale techniques.
- One ore will be selected where detailed bench-scale leachability studies will be carried out for scale-up data.
- Data will be used to generate preliminary technical-economic feasibility of heap leach on New Brunswick ores.

Year: 1986-87

Date: April 30, 1986

Original: April 30, 1986

Revised:

PROJECT IDENTIFICATION AND ANNUAL PLAN

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

Area: New Brunswick

PROGRAM: II - Mining and Minerals Technology

PROJECT: Extraction Possibilities of Specialty Metals

RESPONSIBILITY: Mineral Resources

DURATION: October-March 1986

OBJECTIVES AND DESCRIPTION (WHY, WHAT, WHEN, BY WHOM, HOW):

It is expected that speciality metals (such as gallium, germanium, beryllium, platinum group, titanium, rare earths, indium, magnesium, lithium and zirconium) used in electronics, specialty ceramics, catalysts alloys, and chemicals will undergo a significant growth over the next five years. Some of the factors that will influence their growth will include: the use of gallium, rare earths and precious metals in semiconductors, printed circuit boards, connectors and computer memory; the development of beryllium, magnesium, and titanium for aerospace and automotive specialty alloys; the use of germanium and zirconium materials for advanced ceramics, fiber optics and engine components. A majority of these metals are known to exist in the ores of New Brunswick and are present in the tailings of various milling operations. The initial phase of this project will include the analysis of metal grades from various sources and an economic evaluation of grades. A second phase of the project will include identifying possible extraction methods and commercial processes available to bring these metals to the markets indicated. Bench-scale testing will be carried out to identify the technical feasibility of metal recoveries.

OUTPUTS:

A final report will be completed, identifying sources of these metals and processing methods available to produce a marketable specialty metal.

BENEFITS:

To initiate an interest to orebody development and strengthen the longevity of existing operations through the possibility of bleed stream processing.

RESOURCES (EST.):

	86/87
Manhours: 600 hrs.:	$ 7,562
Project Expenditures:	$17,500
Equipment:	$15,000
Total	$40,062

PLANS FOR FISCAL YEAR:

- Collection of samples, identify grades of various speciality metals and carry out a preliminary evaluation of extraction economics. Ores having commercial probability to be selected.
- Literature search on possible processing routes. A process evaluation to be carried out on the possible routes, based on a technical and economic feasibility of each process.
- Bench-scale testing of process selection to be initialized.

E

Year: 1986-87

Date: April 30, 1986

Original: April 30, 1986

Revised:

PROJECT IDENTIFICATION AND ANNUAL PLAN

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

Area: New Brunswick

PROGRAM: II - Mining and Minerals Technology

PROJECT: Beneficiation of Complex Sulfide Ores for Add-on Processing

RESPONSIBILITY: Mineral Resources

DURATION: November 1986 - February 1989

OBJECTIVES AND DESCRIPTION (WHY, WHAT, WHEN, BY WHOM, HOW):

The Government of New Brunswick has been looking at the possibility of a centralized base metal concentrator. This type of mill would require a process and a location custom to all reserves of the northern part of the province. Before economics and the feasibility of a custom mill can be resolved, information on reserves, ore mineralogy characteristics, and processing options will have to be reviewed. Recognition of the potential difficulty in metallurgical processing of complex sulfide ore makes hydrometallurgy and pyrometallurgy methods quite attractive. In order for chemical processing to be economically successful, the ability to produce commercially valuable products on-site and a primary upgrading (beneficiation process) will be required to lower capital costs. This project will address the possible grade-recovery versus grind relationships for various flowsheet configurations to produce a bulk concentrate. The bulk concentrate from each ore will be characterized for leachability using ferric chloride leachant.

OUTPUTS:

Final report on the technical feasibility of various flowsheets for bulk concentrate production.

BENEFITS:

To provide a data base for an economic evaluation of a custom mill.

RESOURCES (EST.):

	86/87
Manhours: 650 hrs.:	$ 8,192
Project Expenditures:	$ 8,000
Equipment:	$15,000
Total	$31,192

PLANS FOR FISCAL YEAR:

. Collection of samples from various orebodies and mineralogical characterization of all ores.

. Literature search on possible beneficiation flow schemes.

. Bench-scale work on flowsheet development to be initiated.

Year: 1987-88

Date: February 23, 1987

Original: February 23, 1987

Revised:

Project Identification and Annual Plan

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

AREA: New Brunswick

SUBPROGRAM: Mineral Processing Investigations Program (MPIP)

PROJECT: Process Development of Mount Pleasant Tungsten Ores

RESPONSIBILITY: Mineral Development - DNRE

OBJECTIVES AND DESCRIPTION:
(why, what, when, by whom, how)

DURATION: April 1987 - March 1988

The North Fire Tower Zone at Mount Pleasant contains a mixture of tungsten, molybdenum, tin, fluorspar and various sulfides that are metallurgically quite difficult to separate. The processing limitations to grade and recovery for commerical production of Mount Pleasant tungsten ores have been documented. The project will investigate various separation options to overcome these limitations. An economic analysis of the ore body indicates that tungsten is the primary metal for revenue; however, other metals will have to be considered in a flowsheet to overcome economic constraints. The project will investigate various possible flowsheet configurations and identify grade and recovery relationships as a function of grind.

OUTPUTS:

Quarterly progress reports and a final report on the preliminary economic and technical feasibility of processing the North Fire Tower Zone.

BENEFITS:

Provide data on possible avenues to further develop extraction methods of the ore body (in view of a strengthing market for tungsten).

RESOURCES(EST)	84/85	85/86	86/87	87/88	88/89	Total
Administration	-	-	-	30,000	-	30,000
Project Expenditures	-	-	-	15,000	-	15,000
Other	-	-	-	0	-	0
Total	-	-	-	45,000	-	45,000

PLANS FOR FISCAL YEAR

-include implementation process, what will be done, where, expected outputs etc.

-an evaluation of Mount Pleasant will include:

(a) Sampling of the ore, mineralogy and ore characteristics such as particle size distribution, work index, etc.
(b) Evaluation of pre-beneficiation methods to lower capital and operating costs.
(c) Evaluation of primary beneficiation circuit unit operations.
(d) Flowsheet development and grade-recovery versus grind relationships.
(e) To determine optimum point of by-product extraction from circuit.
(f) Evaluation of chemical conversion to meet market specifications.
(g) Economic and technical evaluation of process from bench scale data.

Year: 1987-88

Date: February 23, 1987

Original: April 30, 1986

Revised: February 23, 1987

Project Identification and Annual Plan

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

AREA: New Brunswick

SUBPROGRAM: Mineral Processing Investigations Program

PROJECT: Beneficiation of Complex Sulfides Ores for Add-on Processing

RESPONSIBILITY: Mineral Development - DNRE

OBJECTIVES AND DESCRIPTION:
(why, what, when, by whom, how)

DURATION: November 1986 - March 1988

The Mineral Development Branch is reviewing the possibility of a centralized base metal concentrator having a process and a location custom to all complex sulfide reserves of northern New Brunswick. A literary review of complex sulfide processing has been compiled as a prefeasibility study providing a direction for seed development to a custom mill concept. The processing limitations for a "custom mill" (defined as a combination of beneficiation and metal extraction processes optimally suited to treat complex sulfide ores ranging in grades from 0.2-1.4% Cu, 1.5-4.5% Pb, 4-10% Zn and 0.005-0.01% Ag) have been reviewed where bulk flotation has been selected as the most probable alternative for primary upgrading. The objective of this study is to establish data on grade-recovery versus grind relationships with respect to flowsheet design, reverse flotation versus bulk flotation, ore type and conventional froth flotation versus column flotation.

OUTPUTS:

Quarterly progress reports and a final report to be issued on the technical and economic possibilities pertaining to the production of a bulk sulfide concentrate based on a custom mill concept.

BENEFITS:

Data to be provided for the economic consideration of a custom mill having bulk flotation as primary upgrading for add-on processes such as sulfation roast leach, pressure leach, or chloride leach. Data to assist development of add-on technology and of column flotation.

RESOURCES(EST)	84/85	85/86	86/87	87/88	88/89	Total
Administration	-	-	23,192	15,000	-	38,192
Project Expenditures	-	-	8,000	10,000	-	18,000
Other	-	-	0	0	-	0
Total	-	-	31,192	25,000	-	56,192

PLANS FOR FISCAL YEAR

-include implementation process, what will be done, where, expected outputs etc.

(a) Establish flotation kinetics and grade-recovery relationships for various grinds and reagent consumption.

(b) Flowsheet design and bench testing using lock cycle - batch froth flotation and column flotation techniques.

(c) Particle size analysis and mineralogy-liberation studies to be carried out to compare various separator and flowsheet options.

(d) Technical and economic evaluation of each process option to be engineered based on bench scale data.

Year: 1987-88

Date: February 23, 1987

Original: February 23, 1987

Revised:

Project Identification and Annual Plan

CANADA-NEW BRUNSWICK, 1984-89
PROVINCIAL PROJECT (Federally Funded)

AREA: New Brunswick

SUBPROGRAM: Mineral Processing Investigations Program (MPIP)

PROJECT: Processing of Speciality Metals - Phase II

RESPONSIBILITY: Mineral Development - DNRE

OBJECTIVES AND DESCRIPTION:
(why, what, when, by whom, how)

DURATION: April 1987 - March 1988

Metals that are providing specific technical advantages to high tech industries such as aerospace, automotive, electronics and telecommunications are experiencing significant growth in contrast to base metals used in basic iron, steel and aluminum industries. Various metals such as gallium, germanium, indium, lithium yttrium, rare-earths, titanium and zirconium have been identified at various locations in New Brunswick which include the Durham Mines, Albert County Titanium, Mount Pleasant, Brunswick No. 12 Mine and fly ash. Phase I of this project identified the economic and marketing potential for speciality metals. Phase II of the project will include the identification and the bench testing of the possible extraction methods to commercially bring these metals to the markets indicated in phase I.

OUTPUTS:

Quarterly progress reports and a final report on a bench scale characterization of extraction methods for speciality metals and on the technical-economic assessment of extraction possibilities.

BENEFITS:

To establish a technical-economic feasibility of extracting speciality metals in New Brunswick.

RESOURCES(EST)	84/85	85/86	86/87	87/88	88/89	Total
Administration	-	-	-	15,000	-	15,000
Project Expenditures	-	-	-	15,000	-	15,000
Other	-	-	-	0	-	0
Total	-	-	-	30,000	-	30,000

PLANS FOR FISCAL YEAR

-include implementation process, what will be done, where, expected outputs etc.

(a) Preliminary investigation of feed characteristics, information on mineralogy, composition of material, identify recoverable metals.

(b) Analysis of process options to upgrade material to a marketable form considering: the main recovery/concentration process and the upgrading process.

(c) Bench test process options on the most commercially probable ores and the identification of technical limitations.

(d) Technical and economic evaluation of speciality metal production processes in New Brunswick, based on bench scale data.